IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF OKLAHOMA

STATE OF OKLAHOMA, ex rel, W. A. DREW EDMONDSON, in his capacity as ATTORNEY GENERAL OF THE STATE OF OKLAHOMA, and OKLAHOMA SECRETARY OF THE ENVIRONMENT C. MILES TOLBERT, in his capacity as the TRUSTEE FOR NATURAL RESOURCES FOR THE STATE OF OKLAHOMA,	
Plaintiff,	CASE NO. 05-CV-329-GKF- SAJ
V.	
TYSON FOODS, TYSON POULTRY, INC., TYSON CHICKEN, INC., COBB-VANTRESS, INC., AVIAGEN, INC., CAL-MAINE FOODS, INC., CAL-MAINE FARMS, INC., CARGILL, INC., CARGILL TURKEY PRODUCTS, LLC, GEORGE'S, INC., GEORGE'S FARMS, INC., PETERSON FARMS, INC., SIMMONS FOODS, INC AND WILLOWBROOK FOODS, INC.	§
Defendants.	

AFFIDAVIT OF VALERIE J. HARWOOD, Ph.D.

The undersigned, Valerie J. Harwood, does solemnly swear and state:

1. My education includes a Bachelor's degree in French from Iowa State University, a Bachelor's degree in Biology from the State University of New York at Plattsburgh,

EXHIBIT 16

and a Ph.D. in Biomedical Sciences from Old Dominion University & Eastern Virginia Medical School in Norfolk, VA (1992).

2. From 1992 to 1995 I held a full-time postdoctoral research position at the University of Maryland Center of Marine Biotechnology. In 1995 I joined the Department of Natural Sciences at the University of North Florida as a tenure-track Assistant Professor, where I taught microbiology and related courses, and maintained a research laboratory until I joined USF in 1998. Since August, 1998 I have been employed by the University of South Florida (USF) in Tampa, FL in a full-time, tenure-track position. In 2004 I was promoted from Assistant Professor to Associate Professor, which is my current rank. My responsibilities at USF include teaching undergraduate and graduate courses in microbiology, mentoring undergraduate and graduate research students, university and community service, and maintaining an active research program. My research laboratory personnel currently include two technicians, seven Ph.D. students, one Master's student and four undergraduate research students. My research focuses on microbial water quality, with particular emphasis on microbial source tracking (MST), a field of environmental microbiology that seeks to determine the source of fecal contamination in water by identifying specific molecular signatures in the DNA of fecal microorganisms.

3. I am the author of 27 peer-reviewed publications, over 30 technical reports, a book chapter, and have been an invited speaker on water quality research and MST over 50 times across the U.S., in the U.K. and in New Zealand. I also contributed substantially to

the U.S. Environmental Protection Agency Microbial Source Tracking Guide Document. I am a reviewer for many scientific journals including Environmental Science & Technology, Microbiology and Journal of Applied Microbiology, and am a member of the editorial review board of Applied & Environmental Microbiology. I have served on state and federal grant panels including Sea Grant, National Oceanic and Atmospheric Administration (NOAA) and the United States Department of Agriculture (USDA), and have been awarded over $3 million in grant funding from various agencies including the National Science Foundation, NOAA, Sea Grant, USDA, United States Environmental Protection Agency (USEPA) and National Institutes of Health. My current funding for MST research totals over one-half million dollars from agencies including the Florida Department of Environmental Protection, the Florida Department of Health, NOAA and the USEPA.

4. I was retained by the Oklahoma Attorney General concerning his investigation of poultry waste disposal in the Illinois River Watershed (IRW). My experience and expertise was sought in the matter of microbial contamination of water bodies, its possible consequences to human health, and the major sources of microbial contamination to the IRW.

5. Flint Creek, Baron Fork Creek and the Illinois River all lie within the IRW, and were designated Scenic River Areas by the Oklahoma Legislature in 1970. Recreational water use, such as swimming, canoeing and kayaking, draws tourists and is also enjoyed by many of the residents; however, segments of each of these water bodies

have been designated "impaired" due to contamination from fecal bacteria. The impaired status means that the levels of fecal indicator bacteria are high enough to signal an immediate, unacceptable health risk to recreational water users according to State standards. Several fecal indicator bacteria types are recognized by various regulatory agencies in the U.S. for monitoring the quality of freshwater bodies for recreational use, including fecal coliforms, *Escherichia coli* (*E. coli)* and enterococci. All of these bacteria are readily detected in human and most animal feces (including poultry), and are therefore used as a warning that fecal contamination has occurred, and that there is an unacceptable risk of humans contracting a disease from pathogens (disease-causing microorganisms) in the water. Poultry shed fecal indicator bacteria in their feces, including fecal coliforms, *E. coli* and enterococci, and thus can contribute to impairments of surface waters.

6. Contamination of water bodies by feces of animals that shed human pathogens carries a substantial and immediate human health risk, particularly when those pathogens are known to be transmitted by the waterborne route. Such pathogens can be transmitted by drinking contaminated water (particularly untreated water from groundwater wells or springs) or by accidental ingestion during recreational activities. These exposures to pathogens generally result in infection of the gastrointestinal tract. Poultry are included among those animals known to carry waterborne pathogens in their feces, including Campylobacter *jejuni* and *Campylobacter. coli* (campylobacteriosis and Guillain Barre syndrome), *Salmonella enterica* (salmonellosis), and pathogenic *E. coli*

such as the O157:H7 strain. Campylobacteriosis and salmonellosis are characterized by fever, abdominal pain, vomiting and diarrhea. Although healthy adults generally fully recover, children, the elderly and immunocompromised individuals are at greater risk for more severe, potentially life threatening, infections. Campylobacteriosis can result in Guillain Barre syndrome, a debilitating condition characterized by damage to the central nervous system, while complications from salmonellosis include reactive arthritis and heart damage. Enteropathogenic *E. coli* can cause symptoms that are similar to salmonellosis, but many cases are more severe and can result in kidney damage or death. Poultry feces may also serve as a reservoir for emerging infectious diseases such as viruses that may evolve to make the transition from infecting an animal host to causing human infections, a situation that has potentially devastating implications for human health. An example of this possibility is the recent occurrence of deadly infections in humans caused by the avian influenza virus H5N1.

7. Poultry litter is the fecal-contaminated bedding material used in poultry production. This material becomes soiled and mixed with manure as animals urinate and defecate on it, and is cleaned periodically from the poultry houses. In large poultry production operations, including farms in and near the IRW, the poultry litter is land-applied on agricultural fields. Rainfall washes this material from the fields and into ditches or streams that ultimately reach the major water bodies. Furthermore, the substratum of the land comprising the watershed is porous karst, which presents an imperfect barrier to penetration of land-applied materials. Microorganisms and chemicals in land-applied poultry litter thus impact the quality of surface water, which is used for recreational

activities and as a drinking water source, and groundwater, which is also used as drinking water (usually untreated) extensively in the rural areas of the IRW.

8. Testing of poultry litter, soils upon which poultry litter has been applied, and edge-of-field samples taken from ditches during runoff conditions all show high levels of fecal indicator bacteria, some of which approach the levels expected in raw sewage. When these bacteria reach the extensive network of IRW tributaries, they contribute to impairment of the Illinois River and its tributaries. The pathogenic microorganisms that are also present in poultry feces can impact the health of those who use the river for recreation, and also penetrate into the groundwater and contaminate the area's rural drinking water source. Sampling of IRW surface water, groundwater, soil and sediments has revealed a unique chemical and bacterial signature that indicates contamination by poultry; and this signature is not present in areas that are remote from poultry operations. Furthermore, the fecal indicator bacteria concentrations in the IRW tributaries are not characteristic of those in rural, unimpacted areas; in fact, they are similar to those we see in highly impacted urban waters, underscoring the impact of poultry fecal contamination. Thus, the disposal of poultry waste by land application in the IRW presents a substantial, serious and immediate threat to human health.

9. If land application of poultry litter continues in the IRW, the loading of bacteria and particulate matter, which contributes to water turbidity, will continue. Much of this particulate matter settles out in stream bottoms and forms a habitat where the microbial contaminants can survive for long time periods – on the order of months or longer. The

quality of surface water and groundwater in the IRW will continue to decline and the threat to human health will remain or increase. If land application of poultry litter ceases a major source of microbial contamination to the IRW will be removed. Once land application ceases and rain events over a season scour the contaminated soils and sediments, microbial water quality should substantially improve and the threat to human health will substantially decrease.

FURTHER AFFIANT SAYETH NOT.

Valerie J. Harwood

Valerie J. Harwood

Subscribed and sworn to me by Valerie J. Harwood, on the 8th day of November, 2007.

Signature

Janet Gauthier

Printed Name

Notary Public, State of Florida, County of Hillsborough

My Commission Expires:

JANET P. GAUTHIER
Comm# DD0684069
Expires 6/11/2011
Florida Notary Assn., Inc